

a7  
cont.  
plurality of mirror elements receiving X-rays reflected by said first plurality of mirror elements.--

REMARKS

Claims 1-50 are pending. By this Amendment, claims 32-50 are added, and claims 1-4, 6, 7, 10, 12, 13, 16, 17, 19 and 20 are amended. The attached Appendix includes a marked-up copy of each rewritten claim (37 C.F.R. 1.121 (c)(1)(ii)).

The Examiner is requested to consider the references identified and submitted by the attached Information Disclosure Statement filed herewith.

Further examination and allowance of this application are earnestly solicited.

Respectfully submitted,



James A. Oliff  
Registration No. 27,075

Mario A. Costantino  
Registration No. 33,565

JAO:MAC/ccs

Attachments:

Appendix  
Amendment Transmittal  
Information Disclosure Statement  
RCE

Date: June 13, 2001

**OLIFF & BERRIDGE, PLC**  
**P.O. Box 19928**  
**Alexandria, Virginia 22320**  
**Telephone: (703) 836-6400**

|  |
|--|
| <p>DEPOSIT ACCOUNT USE<br/>AUTHORIZATION<br/>Please grant any extension<br/>necessary for entry;<br/>Charge any fee due to our<br/>Deposit Account No. 15-0461</p> |
|--|

## APPENDIX

## Changes to Claims:

Claims 32-50 are added.

Claims 1-4, 6, 7, 10, 12, 13, 16, 17, 19 and 20 are amended.

The following is a marked-up version of each amended claim:

1. (Amended) An exposure apparatus for exposing with X-rays a pattern present on a mask onto a photosensitive substrate, comprising:
  - a. an optical system having a plurality of reflective surfaces arranged in an optical path to receive the X-rays so as to guide the X-rays to the mask and to transfer the mask pattern onto the photosensitive substrate; and
  - b. a detection apparatus ~~arranged adjacent~~ electrically connected to at least one of said reflective surfaces and designed to detect photoelectrically generated electrons from said at least one of said reflective surfaces when said at least one of said reflective surfaces is irradiated with the X-rays, and to provide a first output signal corresponding to an amount of said photoelectrically generated electrons detected.
2. (Amended) An exposure apparatus according to claim 1, further including:
  - a. an exposure dose calculation apparatus, electrically connected to said detection apparatus, for calculating based on said first output signal, an exposure dose of the X-rays at the mask and capable of generating a second output signal corresponding ~~thereto~~ to the exposure dose; and
  - b. an X-ray limiting apparatus electrically connected to said exposure dose calculation apparatus, for controlling the illumination of the X-rays based on said second output signal.

3. (Amended) An exposure apparatus according to claim 1, further including:
  - a. an exposure dose calculation apparatus, electrically connected to said detection apparatus, for calculating based on said first output signal, an exposure dose of the X-rays at the photosensitive substrate and capable of generating a second output signal corresponding thereto to the exposure dose; and
  - b. an X-ray limiting apparatus electrically connected to said exposure dose calculation apparatus, for controlling the illumination of the X-rays based on said second output signal.
4. (Amended) An exposure apparatus according to claim 1, ~~wherein said optical system further includes a plurality of optical elements, and~~ further including:  
a detection apparatus designed unit electrically connected to said detection apparatus so as to detect a deterioration in one or more of said at least one of said reflective surfaces with respect to an optical characteristics characteristic of at least one of a reflective surface and an optical element in said plurality of reflective surfaces and said plurality of optical elements.
6. (Amended) The exposure apparatus according to claim 1, wherein said at least one of said reflective surfaces further comprises a film made of a material selected from one or more materials from the group of materials ~~comprising~~ consisting of: molybdenum, ruthenium, rhodium, silicon and silicon oxide.
7. (Amended) An exposure apparatus according to claim 5, wherein said detection apparatus further comprises an electrode member having a positive electric potential with respect to said ground and is arranged in the vicinity of said at least one of said reflective surfaces.
10. (Amended) An exposure apparatus for exposing a pattern present on a mask onto a photosensitive substrate, comprising:

- a. an X-ray radiation source that generates X-rays;
  - b. an illumination optical system that guides said X-rays to the mask;
  - c. a projection optical system having a plurality of reflective surfaces arranged so as to ~~guide said X-rays from the mask to~~ transfer the mask pattern onto the photosensitive substrate; and
  - d. a detection apparatus ~~arranged adjacent~~ electrically connected to at least one of said reflective surfaces and designed to detect photoelectrically generated electrons from said at least one of said reflective surfaces when said at least one of said reflective surfaces is irradiated with said X-rays, and to provide a first output signal corresponding to an amount of said photoelectrically generated electrons detected.
12. (Amended) The exposure apparatus according to claim 10, wherein said at least one of said reflective surfaces further comprises a film made of a material selected from one or more materials from the group of materials ~~comprising~~ consisting of: molybdenum, ruthenium, rhodium, silicon and silicon oxide.
13. (Amended) An exposure apparatus comprising:
- a. an X-ray radiation source that generates X-rays;
  - b. an optical system disposed in an optical path to receive said X-rays and that guides said X-rays to a mask having a ~~first~~ pattern, and then to a photosensitive substrate so as to form on the photosensitive substrate the pattern of the mask, said optical system including ~~an~~ a plurality of optical element that elements, at least one of said optical elements exhibits a photoelectric effect upon irradiation by said X-rays ~~when said optical element is arranged in an optical path between said X-ray radiation source and said photosensitive substrate; and~~

- c. a detection apparatus arranged relative to said at least one of said optical element elements so as to detect photoelectrically generated electrons from said at least one of said optical element elements, and which provides a first output signal corresponding to an amount of said photoelectrically generated electrons detected.
- 16. (Amended) An exposure apparatus according to claim 13, ~~wherein said optical system further includes a plurality of optical elements, and further including:~~
  - a detection apparatus ~~designed unit~~ electrically connected to said detection apparatus so as to detect a deterioration ~~in one or more optical characteristics of at least one of a reflective surface and an optical element in said plurality of reflective surfaces and said plurality of optical elements~~ of said at least one of said optical elements with respect to an optical characteristic.
- 17. (Amended) An exposure apparatus according to claim 13, further including:
  - a. a deformation quantity calculation apparatus that calculates an amount of deformation of at least one ~~reflective surface of said plurality of reflective surfaces of said optical elements~~ based on said first output signal, and which generates a second output signal corresponding to said amount of deformation;
  - b. an adjustment quantity calculation apparatus, electrically connected to said deformation quantity calculation apparatus, that calculates an amount of adjustment of said at least one ~~reflective surface of said optical elements~~ necessary to eliminate said amount of deformation based on said second output signal, and generates a third output signal corresponding to said amount of adjustment; and
  - c. an adjustment apparatus, electrically connected to said adjustment quantity calculation apparatus, that adjusts said at least one ~~reflective surface of said~~

optical elements based on said third output signal, so as to correct said amount of deformation of said at least one reflective surface of said optical elements.

19. (Amended) An exposure apparatus according to claim 18, wherein said detection apparatus further comprises an electrode member having a positive electric potential with respect to said ground and is arranged in the vicinity of said ~~one of said reflective surfaces~~ at least one of said optical elements.
20. (Amended) An exposure apparatus according to claim 13, further including:
- a. a mask stage capable of holding the mask;
  - b. a substrate stage capable of holding the photosensitive substrate;
  - c. a projection optical system arranged in an optical path formed between said mask stage and said substrate stage, said projection optical system is included in said optical system; and
  - d. a drive apparatus capable of moving said mask stage and said substrate stage relative to said projection optical system.